EXHIBIT 6

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Case No. MBHB 02-252-B)

In the Application of: Eric B. Cummings	Confirmation No. 5955
Serial No.: 09/866,165	Art Unit: 1713
Filed: June 20, 2001	Examiner: Ling Siu Choi
For: Dielectrophoretic Systems Without Embedded Electrodes	

RESPONSE TO THE FINAL OFFICE ACTION
MAILED JUNE 16, 2005

MAIL STOP AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the final Office Action of June 16, 2005, please amend the above-identified application as shown below.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 8 of this paper.

Appendices A, B, and C including supporting references are attached following page 13 of this paper.

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) An apparatus for dielectrophoretic separation, comprising:

a fluid flow channel disposed on a substrate, wherein said fluid flow channel is provided with fluid inlet and outlet means in fluid communication with said fluid flow channel, and wherein said fluid flow channel has a plurality of insulating structures disposed therein;

~~an electrode~~ electrodes in electric communication with each fluid inlet and outlet means, wherein the electrodes are positioned to generate a spatially non-uniform electric field across the plurality of insulating structures, and wherein the spatially non-uniform electric field exerts a dielectrophoretic force on a sample undergoing separation; and

power supply means connected to said electrodes to generate an electric field within said fluid flow channel,

wherein electroosmotic flow of a fluid in said fluid flow channel is not suppressed.

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2. (original) The apparatus of claim 1, wherein said fluid flow channel is an open channel.

3. (original) The apparatus of claim 1, wherein the substrate is a polymer material.

4. (original) The apparatus of claim 1, wherein the plurality of insulating structures is arranged in an array.

5. (original) The apparatus of claim 1, wherein at least a portion of the cross-sectional shape of the insulating structures in the plane of fluid flow is composed of a circle, a straight line, a cusp, a concave curve, a convex curve, or an acute angle, or combinations thereof.

6. (original) The apparatus of claim 5, wherein the insulating structures comprise circular posts.

7. (original) The apparatus of claim 5, wherein the insulating structures are square posts.

8. (original) The apparatus of claim 1, wherein the insulating structures are joined together.

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9. (original) The apparatus of claim 1, wherein the electric field is a substantially constant applied electric field.

10. (original) The apparatus of claim 1, wherein the electric field varies in amplitude and period.

11. (original) The apparatus of claim 1, wherein the electric field has a non-zero cyclic average.

12. (original) The apparatus of claim 1, wherein the electric field is a combination of an electric field that is substantially constant and an electric field that varies in amplitude and period.

13. (original) The apparatus of claim 1, wherein the electric field is aligned at an angle with respect to the array of posts.

14-25. (canceled)

26. (currently amended) An apparatus for concentrating and spatially segregating particles, comprising:

a fluid flow channel disposed on a substrate, wherein said fluid flow channel is provided with first and second ends, and fluid inlet and outlet means in fluid communication with the

first and second ends, and wherein said fluid flow channel has a plurality of insulating structures disposed therein;

~~an electrode~~ electrodes in electric communication with each fluid inlet and outlet means, wherein the electrodes are positioned to generate a spatially non-uniform electric field across the plurality of insulating structures, and wherein the spatially non-uniform electric field exerts a dielectrophoretic force on a sample undergoing separation; and

power supply means connected to said electrodes to generate an electric field within said fluid flow channel, wherein the second end of said fluid flow channel is tapered to concentrate the electric field, and wherein electroosmotic flow of a fluid in said fluid flow channel is not suppressed.

27. (original) The apparatus of claim 26, wherein said fluid flow channel is an open channel.

28. (original) The apparatus of claim 26, wherein the substrate is a polymer material.

29. (original) The apparatus of claim 26, wherein the plurality of insulating structures is arranged in an array.

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30. (original) The apparatus of claim 29, wherein the array of insulating structures is shaped so as to concentrate the electric field.

31. (currently amended) An apparatus for dielectrophoretic separation, comprising:

a fluid flow channel disposed on a substrate, wherein said fluid flow channel is provided with fluid inlet and outlet means in fluid communication with said fluid flow channel, and wherein said fluid flow channel has a plurality of insulating structures disposed therein;

~~an electrode~~ electrodes in electric communication with each fluid inlet and outlet means, wherein the electrodes are positioned to generate a spatially non-uniform electric field across the plurality of insulating structures, and wherein the spatially non-uniform electric field exerts a dielectrophoretic force on a sample undergoing separation; and

power supply means connected to said electrodes to generate an electric field within said fluid flow channel,

wherein the insulating structures comprise circular posts.

32. (previously presented) The apparatus of claim 31, wherein the plurality of insulating structures is arranged in an array.

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33-35. cancelled

36. (currently amended) An apparatus for dielectrophoretic separation, comprising:

a fluid flow channel disposed on a substrate, wherein said fluid flow channel is provided with fluid inlet and outlet means in fluid communication with said fluid flow channel, and wherein said fluid flow channel has a plurality of insulating structures disposed therein;

~~an electrode~~ electrodes in electric communication with each fluid inlet and outlet means, wherein the electrodes are positioned to generate a spatially non-uniform electric field across the plurality of insulating structures, and wherein the spatially non-uniform electric field exerts a dielectrophoretic force on a sample undergoing separation; and

power supply means connected to said electrodes to generate an electric field within said fluid flow channel,

wherein the insulating structures comprise square posts having sides that are parallel to the fluid flow channel.

37. (previously presented) The apparatus of claim 36, wherein the plurality of insulating structures is arranged in an array.

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REMARKS

Claims 1, 26, 31, and 36 have been amended to further clarify the invention. Support for the amendments can be found in the specification, for instance, at page 3, lines 16-20. Claims 33-35 have been cancelled without prejudice to the filing of continuation applications. No new matter is added by the amendments. With the amendments, claims 1-13 and 26-32 and 36-37 are pending. The claim rejections are addressed below.

Rejections Under 35 U.S.C. § 112

Claims 1-13 and 26-30 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to use the invention. In particular, the Office objects to the phrase "wherein electroosmotic flow of a fluid in said fluid flow channel is not suppressed," which was added to the claims in the preceding Office Action response. Applicants respectfully disagree with the rejection. The objected to phrase simply makes explicit that which was inherent in the original application's disclosure.

The MPEP instructs that "while there is no *in haec verba* requirement, newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure." MPEP §2163(I)(B). That is, simply because an added claim term does not appear in the specification does not mean

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that its addition constitutes new matter if otherwise supported by the specification. "In order for a disclosure to be inherent...the missing descriptive matter must necessarily be present in the...application's specification such that one skilled in the art would recognize such a disclosure." In re Cortright 49 USPQ2d 1464, 1469 (CAFC 1999), citing Tronzo v. Biomet, Inc., 47 USPQ2d 1829, 1834 (CAFC 1998).

Applicants submit that the limitation "wherein electroosmotic flow of a fluid in said fluid flow channel is not suppressed" would be recognized by a person of ordinary skill in the art as necessarily present in the specification. Evidence of the foregoing is provided by the attached Exhibits.

Exhibit A is a copy of J.I. Molho et al., "Fluid Transport Mechanisms in Microfluidic Devices", Micro-Electro-Mechanical Systems (MEMS), *1998 ASME International Mechanical Engineering Congress and Exposition* (DSC-Vol.66). On the second page, left column, the reference defines electrokinetic flow as "the combination of *electroosmotic* and *electrophoretic* transport." (Italics in the original). This reference was brought to the Office's attention in the response to the preceding office action.

Exhibit B is a copy of Shaw, D. J. *Introduction to Colloid and Surface Chemistry*; Third Edition; Butterworths: Boston, MA,

1980; pp 162-163. The reference indicates that electrophoresis and electroosmosis are components of electrokinetic flow.

Exhibit C is a copy of Probstein, R. F. *Physicochemical Hydrodynamics: An Introduction*; Second Edition; John Wiley & Sons, Inc.: New York, NY, 2005; p 195. This reference, citing Shaw (Exhibit B), confirms that it is established that electrophoresis and electroosmosis are components of electrokinetic phenomena.

The references provided in Exhibits A-C all show that electroosmosis and electrophoresis are components of electrokinetic transport. As pointed out in the response to the preceding office action, fluid flow in the claimed apparatus can be electrokinetically driven (as opposed to exclusively pressure driven as in prior art systems). Thus the objected to claim limitation merely points out that the electroosmotic flow component of this electrokinetic flow is not suppressed. Applicants do not indicate anywhere in their specification that electroosmotic flow in the claimed device is suppressed. The amendment therefore does not add new matter. Reconsideration and withdrawal of the § 112, first paragraph, rejection of claims 1-13 and 26-30 is respectfully requested.

Claims 33-35 also stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one

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skilled in the art to use the invention. In the interest of expediting the remaining claims to allowance, and without acceding to the correctness of the Office's position, Applicants have cancelled claims 33-35. Withdrawal of the § 112, first paragraph, rejection of these claims is therefore respectfully requested.

Rejections Under 35 U.S.C. § 102

Prior to addressing the § 102 rejections, it is respectfully noted that the present claims have been amended to indicate that the claimed device operates to separate particles by dielectrophoresis. The amendment is for clarification purposes only, since it is clear from the specification and the preambles of the claims that an electrophoretic device is the subject of the invention. The amendments, therefore, do not place any additional burden on the office. Accordingly, entry of the amendments is respectfully requested.

Claims 1-13 and 26-37 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,837,115 ("Austin"). It is respectfully submitted that Austin does not teach every element of the claims, as amended. The amended claims are therefore not anticipated by the reference.

Austin describes a sorting apparatus for fractionating and viewing microstructures. Austin, abstract. The apparatus operates on the principles of electrophoresis: using an electric

field to move a charged microstructure, such as DNA, through a fluid. Austin, lines 37-39. Interactions of particles with the posts in the channel of Austin are strictly mechanical, resulting from collisions.

In contrast to Austin, the claimed invention is a dielectrophoretic separation apparatus. As noted above, Applicants have amended the claims to clarify this distinction. Austin makes no mention and does not suggest separation or transport of particles by dielectrophoresis, a process that selectively transports particles based on an induced dipole moment (see instant specification, page 1, line 24 to page 2, line 2). Such a process does not require a particle to carry a charge. Austin, therefore, does not teach the claimed invention. Reconsideration and withdrawal of the § 102 rejection based on Austin is respectfully requested.

Claims 1-13 and 26-37 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 6,596,144 ("Regnier"). It is respectfully submitted that Regnier also does not teach every element of the amended claims. The claims are therefore not anticipated by the reference.

Regnier relates to a separation column for use in chromatography, electrochromatography, and electrophoresis. See abstract. In Regnier, the actions of the posts are simply to restrict pressure driven flow, increase the surface area, and reduce diffusion distances from the flow to the surface,

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considerations that are specific to conventional chromatographic and electrophoretic separations. As with Austin, Regnier does not teach or suggest a device for dielectrophoretic separation. The reference, therefore, does not disclose the claimed invention. Reconsideration and withdrawal of the § 102 rejection based on Austin is respectfully requested.

It is respectfully submitted that the claims are in condition for allowance and notice to this effect is requested. If any outstanding issues remain, the Examiner is urged to contact Applicants' undersigned representative at (312) 913-0001.

Respectfully submitted,

Dated: September 15, 2005 By: 

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